THE FACILITATIVE EFFECT OF AIDED IMAGERY IN SINGLE-TRIAL FREE RECALL

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by

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CHAPTER I

INTRODUCTION

There has been an expanding interest in nonverbal imagery mechanisms in memory phenomena (Paivio, 1969). Imagery or picturability has been studied in several kinds of learning. Words rated high in image-evoking ability improve learning when varied in paired-associate learning (Paivio, 1969), and in multi-trial free recall and recognition memory (Paivio & Csapo, 1969). The use of imagery has been interpreted as serving to mediate recall (Paivio, 1965; Paivio, Yuille, & Madigan, 1968) and as serving to promote organization or clustering (Tulving, McNulty, & Ozier, 1965). Most of the above studies have chosen items from the Paivio et al. (1968) 925-word sample of nouns rated for imagery as stimulus material and thus have neglected the imagery-evoking possibilities of other parts of speech. In the studies that used pictures with words (Paivio & Yarmey, 1966; Paivio & Csapo, 1969), the two items were presented simultaneously. With concrete nouns as stimulus items, the object denoted by the noun has been either depicted (Paivio & Yarmey, 1966; Paivio & Csapo, 1969) or objectively presented (Lieberman & Culpepper, 1965). The hypothesis of the present study was that recall can be enhanced by helping Ss encode the adjectives to be recalled through the presentation of related pictures or synonyms following these

items. These Ss were compared to Ss who were aided in rehearsal of the items to be recalled and to a control group which had an unfilled interval following presentation of the critical adjectives.

CHAPTER II

METHOD

Between-Ss Comparison. Twelve adjectives were selected as stimulus items such that related pictures could readily be obtained. They ranged from 1 to AA ratings in the Thorndike-Lorge listings. Two black-and-white photographs were selected from magazines that were judged by the Es to related to each of the stimulus adjectives. In addition, two synonyms relating to each of the adjectives were selected from Roget's Thesaurus.

The stimulus items, the synonyms, and the related pictures were prepared for projection on 1½-in. slides. The adjectives to be recalled were made prominent by outlining a box around each. To differentiate experimental treatments, each adjective was followed in succession by two filler items. The filler items were either related pictures, synonyms, identical items without boxes (rehearsal), or blank slides (control). The slides were presented by a Kodak Carousel projector with the interval between slide changes regulated by a timer.

The subjects were 144 State University students from [illegible] introductory psychology class who participated in the experiment as part of their course requirement. Forty-eight Ss were randomly assigned to each of the groups.

[illegible] groups of 8 Ss (adjective [illegible])

10 per group) with a .75-sec. exposure time and a .75-sec. inter-slide interval. Each session consisted of the presentation of a sequence of 36 slides—12 adjectives, each followed by two appropriate filler slides as determined by the experimental conditions described above. For example, the picture group viewed the word zigzag printed in a box followed by a photograph of a bolt of lightning and another photograph of a winding mountain road. Then a second boxed adjective was presented followed by two picture slides, etc. Another group had the synonyms snaky and meandrous in place of the picture slides. The synonyms were not printed in boxes. The rehearsal group viewed the identical word zigzag twice again, but without boxes, as the filler slides; the Ss in the control group were presented with two blank slides as the filler slides. At the end of each list of adjectives was a two-digit number. The subjects counted backwards by threes from this number for 20 secs., at which time E gave the signal to stop counting and to begin writing the recalled items on previously-prepared forms. Standard pre-experimental free-recall instructions had advised the Ss that they would be asked to recall only the boxed adjectives in any order. No instructions were given concerning the filler slides. After one, two, or four days, the Ss were again asked (without prior notice) to recall the boxed items. For both recall tasks, the time allowed was unlimited.

Within-Ss Comparison. The same items and procedures were used as in the between-Ss comparison with the following exceptions: three of the 12 adjectives were followed by picture slides, three by synonym slides, three by blank slides and three by slides that repeated the stimulus adjective. The adjectives that were represented in each group and the serial position of each adjective were randomized for each of the 17 individually run Ss. Ten days later, the Ss were again asked to recall the boxed adjectives.

CHAPTER III

RESULTS

The dependent variable was the proportion of boxed adjectives each S recalled on the immediate and delayed tests. These summary data are presented in Table 1.

TABLE 1

Proportion of Items Recalled for Each Treatment

Time of Recall	Treatment			
	Pictures	Rehearsal	Control	Synonym
Between-Ss Comparison (n=41)				
Immediate (20 sec.)	.679	.640	.610	.500
Later (1, 2, or 4 days)	.453	.360	.343	.283
Within-Ss Comparison (n=17)				
Immediate (20 sec.)	.783	.380	.490	.530
Later (10 days)	.470	.177	.273	.293

For the between-Ss comparison, Ss tested for long-term recall one, two and four days after learning did not differ significantly in the number of items recalled, $F(2,175)=1.24$. The immediate and delayed results were combined and the resulting analysis of variance revealed a significant decrease in the

number of items recalled over the interval between immediate and later recall, $F(1,160)=297.56$, p .01. The magnitude of this decrease (2.97 items) did not differ significantly among the different treatments, as reflected by a nonsignificant interaction term. The treatment effect was significant, $F(3,160)=11.38$, p .01, with the picture group showing greater recall (p .01) than the rehearsal and control groups which did not differ significantly. The synonym group, recalled significantly fewer items than the rehearsal and control groups (p .01).

For the within-Ss comparison, a 4x2 repeated-measure analysis of variance was used. Again, significantly fewer items were recalled later than immediately, $F(1,16)=70.30$, p .01, and there was no significant interaction. The treatment effects were significant $F(3,48)=6.97$, p .01. In this analysis, the adjectives with picture fillers were recalled more frequently (p .01) than the adjectives in the synonym, rehearsal, and control conditions, which did not differ.

CHAPTER IV

DISCUSSION

The increased free recall of adjectives followed by related pictures was found in both immediate and later recall, between Ss and within Ss. One interpretation (Paivio, 1967) is that these adjectives were coded into nonverbal images in addition to being stored as words. Thus the Ss viewing picture-aided words had the advantage of two memory systems from which to draw. An alternative interpretation (Tulving, et al., 1965) is that the image provided a basis for grouping the words into clusters or higher-order units. Our interpretation is that not only did pictures provide a second coding system, but that the presented pictures aroused similar permanent memory images. It remains to be determined whether Ss picked one image or both to combine the pictures prompted Ss to develop their own [illegible] images. Indeed, it is not certain that the pictures [illegible] be related to the preceding item in order to facilitate recall. If the Ss are prompted to form their own images, [illegible] should serve to facilitate recall. We would expect, however, that in order to achieve the facilitative effect, pictures should follow rather than precede the stimulus item in the [illegible] sequence.

[illegible] models are based upon the [illegible] that Ss [illegible] previously [illegible] [illegible] (Atkinson and Shiffrin, 1968). [illegible]

and rehearsal groups did not differ, thus indirectly supporting these assumptions.

Probably the material that we selected as stimulus items maximizes the facilitative effect of aided imagery, and material that can be less readily associated with images would not be so likely to show the above effects.

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APPENDIX A

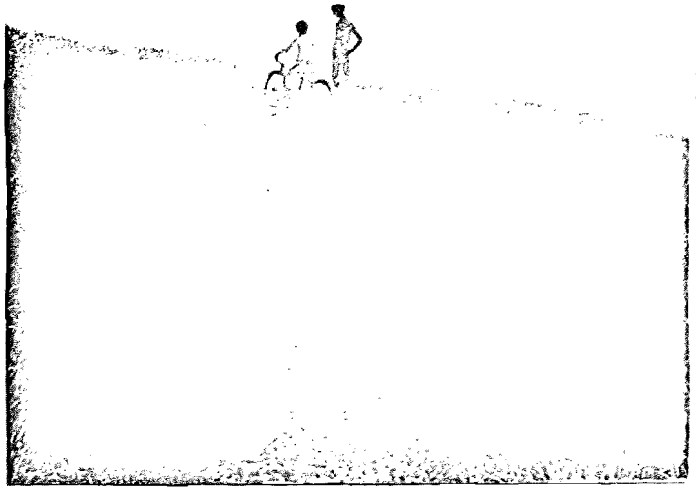
Adjectives

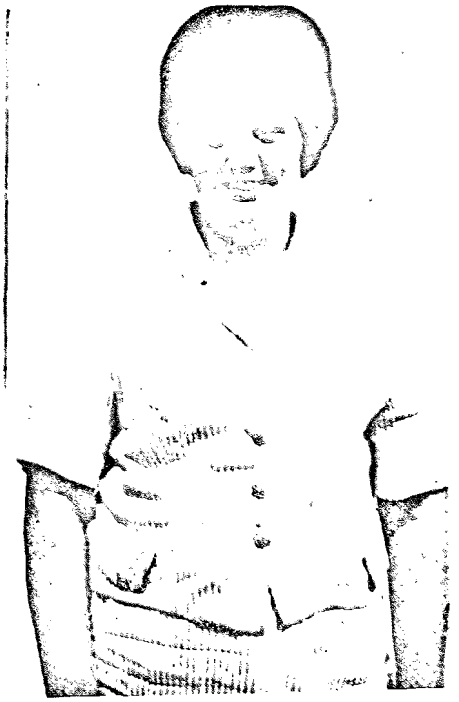
Adjectives

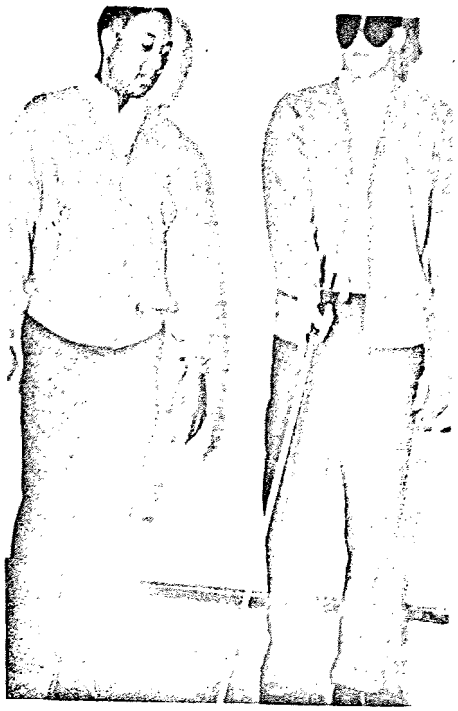
1. old
2. cracked
3. drunken
4. asleep
5. grassy
6. obese
7. underwater
8. blind
9. running
10. zigzag
11. oval
12. wet

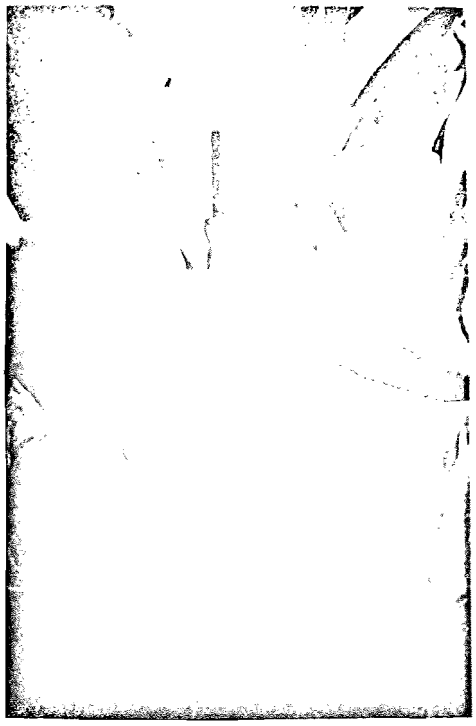
Synonyms

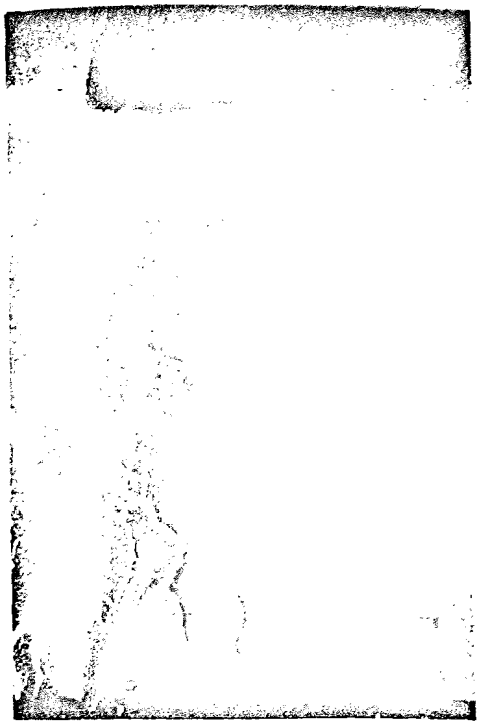
1.	old	elderly	aged
2.	cracked	split	broken
3.	drunken	tipsy	inebriated
4.	asleep	dozing	napping
5.	grassy	turfy	verdant
6.	obese	fat	corpulant
7.	underwater	immersed	submarine
8.	blind	unseeing	sightless
9.	running	scampering	galloping
10.	zigzag	meandrous	snaky
11.	oval	ovoid	ellipse
12.	wet	drenched	moist

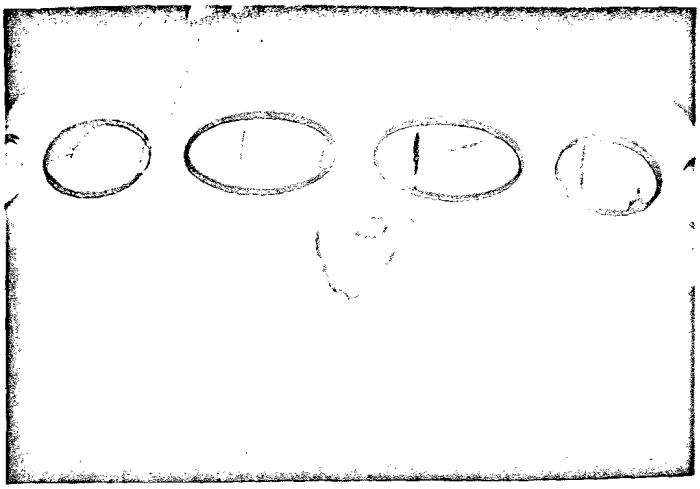


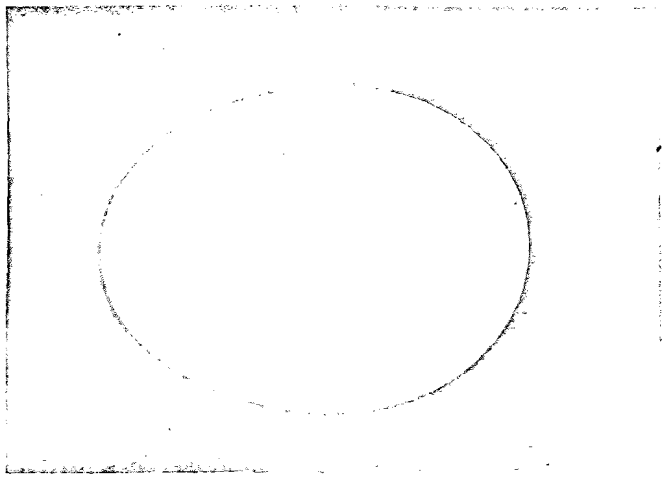


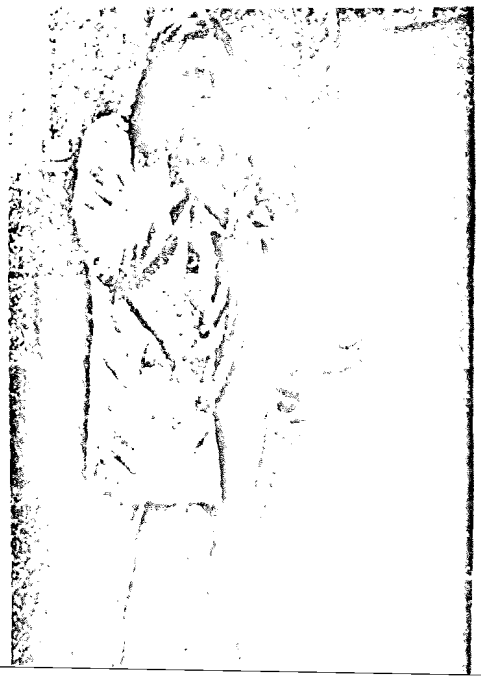












APPENDIX B

Raw Data

Table 1

Number of Items Recalled
Between-Ss Comparison Raw Data

Ss	Rehearsal		Synonym		Control		Pictures	
	ST	LT	ST	LT	ST	LT	ST	LT
1	9	4	9	5	8	5	9	3
2	7	5	7	4	8	3	7	7
3	5	2	4	5	9	6	9	6
4	5	4	4	4	8	5	7	4
5	10	6	3	2	7	4	9	5
6	7	2	4	4	8	4	8	9
7	6	0	6	2	8	6	8	1
8	6	2	6	4	3	0	9	6
9	8	10	3	2	9	5	7	5
10	9	5	6	5	8	3	10	4
11	6	4	5	4	8	6	10	5
12	7	3	8	4	9	4	7	7
13	8	1	7	5	7	3	6	1
14	7	3	9	6	7	2	9	9
15	10	5	6	4	4	2	8	3
16	11	7	5	3	6	4	5	4
17	11	3	6	3	5	1	5	4
18	8	6	8	4	8	7	10	6
19	7	8	4	5	8	5	4	2
20	6	3	7	3	6	4	10	5

Table 1 (cont.)

Number of Items Recalled
Between-Ss Comparison Raw Data

Ss	Rehearsal		Synonym		Control		Pictures	
	ST	LT	ST	LT	ST	LT	ST	LT
21	9	5	9	2	6	6	9	6
22	9	5	6	1	9	3	9	8
23	4	5	9	3	4	5	9	9
24	7	2	4	1	6	0	9	6
25	5	7	9	2	9	7	7	3
26	6	6	4	2	9	4	10	6
27	8	4	6	4	10	8	7	11
28	8	3	6	2	8	1	8	5
29	8	3	6	3	10	7	9	5
30	10	11	9	6	6	3	7	7
31	7	1	6	4	6	3	9	7
32	6	3	7	2	1	0	7	3
33	8	4	5	2	10	6	9	9
34	10	2	3	2	9	4	11	7
35	8	4	5	1	8	4	7	5
36	11	5	6	3	7	6	8	3
37	10	2	4	5	7	2	11	10
38	6	1	2	5	7	8	7	4
39	8	7	4	4	7	6	8	4
40	7	6	5	2	8	3	6	5

Table 2

Number of Items Recalled
Within-Ss Comparison Raw Data

Ss	Rehearsal		Synonym		Control		Pictures	
	ST	LT	ST	LT	ST	LT	ST	LT
1	1	0	2	1	2	1	2	2
2	1	0	3	2	0	0	2	2
3	1	1	2	0	2	2	3	3
4	2	1	0	0	1	1	2	2
5	2	1	2	1	1	1	2	1
6	1	1	1	0	3	0	3	1
7	2	1	0	0	0	0	2	1
8	2	0	2	1	2	1	2	0
9	2	0	0	0	1	1	3	0
10	1	0	2	1	1	1	3	1
11	1	0	2	1	1	1	3	1
12	2	1	2	2	2	1	3	1
13	2	2	2	1	2	1	3	2
14	1	1	2	2	3	1	3	3
15	1	0	2	2	0	0	2	0
16	1	0	0	0	2	1	1	2
17	1	0	2	1	1	1	3	3

APPENDIX C

Analysis of Variance Summary Tables

Analysis of Variance

for the data of Table 1-Page 20

Source	df	MS	F	p
[illegible]				
[illegible]	3	61.57	11.38	<.01
[illegible]	16	5.41		
[illegible]				
[illegible]	1	729.08	227.54	<.01
[illegible]	3	3.57	1.11	ns
[illegible]	16	3.13		

Analysis of Variance

For the data of Table 2-Page 22

Source	df	MS	F	p
[illegible] (A)	3	5.49	6.267	<.001
Time (T)	1	21.441	70.399	<.001
[illegible] (S)	16	1.2		
[illegible]	3	.059	.193	ns
[illegible]	48	.738		
[illegible]	16	.305		
[illegible]	48	.305		